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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	Group Art Unit: 1745
RICHARD D. BREAULT, et al.	)	Examiner:
Serial No.	)	Filed: 11/9/2001
For: DIRECT ANTIFREEZE COOLED FUEL CELL	)	Atty. Docket No. C-2269A

DECLARATION UNDER 37 C.F.R. 1.132

Commissioner of Patents and
Trademarks
Washington, D.C. 20231

Commissioner:

I, Richard D. Breault, a resident of North Kingstown, Rhode Island, being self-employed and working as a consultant for International Fuel Cells LLC, of South Windsor, Connecticut, and being a joint inventor of the above referenced patent application, do hereby make the following "Declaration Under Rule 1.132":

1. My education consists of a BS degree in Chemical Engineering from the University of Connecticut in 1964.

2. I am currently self-employed and working as a consultant for International Fuel Cells LLC of South Windsor, CT. (As of December 5, 2001, the name of "International Fuel Cells, LLC" has been changed to "UTC Fuel Cells, LLC".) I was employed, by various divisions of United Technologies Corporation, from June of 1964 to February of 1997 doing research and development on fuel cells. I have developed fuel cells based on alkaline electrolytes, acid electrolytes, on molten carbonate electrolytes and on solid polymer electrolytes. I am the inventor or co-inventor of forty fuel cell related patents.

EXHIBIT 1

3. International Fuel Cells LLC, is the assignee of all rights in the above referenced patent application, as indicated by the attached copy of an Assignment to International Fuel Cells LLC of all rights in U.S. Patent Application Serial No. 09/359,475, the parent of the above referenced divisional application.

4. As amended by the Preliminary Amendment accompanying the above referenced divisional application, Claim 1 claims:

1. A direct antifreeze cooled fuel cell for producing electrical energy from a reducing fluid and a process oxidant stream, comprising:

a. an electrolyte secured between an anode catalyst and a cathode catalyst;

b. a porous anode substrate secured in direct fluid communication with the anode catalyst for passing the reducing fluid stream adjacent the anode catalyst and a wetproofed cathode support means secured in direct fluid communication with the cathode catalyst for passing the process oxidant stream adjacent the cathode catalyst;

c. a porous cooler plate secured in direct fluid communication with the wetproofed cathode support means; and,

d. a direct antifreeze solution passing through the porous cooler plate for cooling the fuel cell, wherein the direct antifreeze solution is a special direct antifreeze solution having;

i. a freezing point of at least $-20^{0}F$;

ii. a surface tension greater than 60 dyne/cm at an operating temperature of the fuel cell;

iii. a partial pressure of antifreeze above

the solution at the cell operating temperature that is less than 0.005 mm Hg; and,

iv. a capacity of being oxidized by the anode and cathode catalysts at fuel cell voltages.

5. In order for one skilled in the art at the time of filing of the referenced parent application (July 22, 1999) to make and use the claimed direct antifreeze cooled fuel cell of amended claim 1, it is only necessary to screen any potential solution one intended to utilize as a direct antifreeze solution within the claimed fuel cell to determine whether-or-not the potential solution exhibits the properties described in amended claim 1(d); and then to arrange the structural elements described in amended claim 1, sub-paragraphs a, b, and c into a fuel cell with the selected direct antifreeze having properties of claim 1(d).

6. In order to determine whether-or-not the potential solution exhibits the properties of amended claim 1(d) a researcher would typically use both analytical and experimental techniques to estimate and determine the chemical and physical properties of the direct antifreeze solution. With respect to the particular properties identified in amended claim 1(d) in sub-paragraphs i. ("freezing point"), ii. ("surface tension"), iii. ("partial pressure"), and iv. ("oxidation characteristics"):

i. The freezing point of a solution can be analytically predicted from A. V. Wolf, M. G. Brown and P. G. Prentiss, "Concentrative Properties of Aqueous Solutions", CRC Handbook of Chemistry and Physics, R. C. Weast, Ed., CRC Press, Boca Raton, FL (1966); and can be experimentally measured using ASTM procedures D1015-99

Standard Test Method for Freezing Points of High-Purity Hydrocarbons and D1177-94(1998) Standard Test Method for Freezing Point of Aqueous Engine Coolants.

ii. The surface tension of a solution can be analytically predicted from D. B. MacLeod, "On a Relation Between Surface Tension and Density", Trans, Faraday Soc., 19, 38 (1923), S. Sugden; "The Influence of the Orientation of Surface Molecules on the Surface Tension of Pure Liquids", J. Chem. Soc., 125, 1167 (1924; M. Tamura, M. Kurata and H. Odani, "Surface Tension of Aqueous Binary Solutions", Bull. Chem. Soc. Japan, 28, 83 (1955); and can be experimentally measured using ASTM Procedure D3825-90(2000) Standard Test Method for Dynamic Surface Tension by the Fast-Bubble Technique.

iii. The partial pressure of a solution can be analytically predicted from K. M. Watson, "Thermodynamics of the Liquid State-Generalized Prediction of Properties", Ind. Eng. Chem., 35, 398 (1943); D. G. Miller, "Derivation of Two Equations for the Estimation of Vapor Pressures", J. Phys. Chem., 68, 1399 (1964); and can be experimentally measured using ASTM procedures E1194-87(1993)e1 Standard Test Method for Vapor Pressure or E1782-98 Standard Test Method for Determining Vapor Pressure by Thermal Analysis.

iv. The oxidation characteristics of a solution can be analytically predicted using methods described in S. W. Benson, "Thermochemical Kinetics", J. Wiley & Sons, NY (1968) and can be experimentally determined using methods described in Experimental Electrochemistry for Chemists, Donald T. Sawyer and Julian L. Roberts, Jr., John Wiley

and Sons, Chapter 7, p329, 1974 and in Instrumental Methods in Electrochemistry, R. Greef, R. Peat, L.M. Peter, D. Fletcher, and J. Robinson, Ellis Horwood, Chapter 6, p229, 1993.

7. I have performed, or have had performed for me, such screening experiments on potential antifreeze solutions and other solutions.

I, Richard D. Breault hereby declare that all statements made herein of the my own knowledge are true and that all statements made on information and belief are believed to be true. I further state that the above statements were made with the full knowledge that willful false statements and the like are punishable by fine and/or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that any such willful false statements may jeopardize the validity of this application or any patent resulting therefrom.

Richard D. Breault

RICHARD D. BREAULT

Date: December 13, 2001